ORIGINAL RESEARCH

Exploring the Relationship Between Intolerance of Uncertainty and Trust in Physicians from Spousal and Parent-Child Perspectives

Peng Gao[1], Hanwei Wu[2], Zhiguang Fan [3], Min Tao [4]

[1]Department of Chinese Medicine, Changchun University of Chinese Medicine, Changchun, Jilin, People's Republic of China; [2]Department of Foreign Studies, Hunan Normal University, Changsha, Hunan, People's Republic of China; [3]Department of Psychology, School of Teacher Education, Shaoxing University, Shaoxing, Zhejiang, People's Republic of China; [4]Department of Education, Jilin International Studies University, Changchun, Jilin, People's Republic of China

Correspondence: Zhiguang Fan, Department of Teacher Education, Shaoxing University, No. 900, Chengnan Avenue, Shaoxing, Zhejiang, 312000, People's Republic of China, Tel +86-0431-84924101, Fax +86 1 594-831-4623, Email fanyqm@126.com

Objective: The present study aimed to probe the intergenerational transmission of intolerance of uncertainty (IU) and trust in physicians. Besides, through the actor-partner interdependence model (APIM), the predictive effect of parents' IU on their own and their spouses' trust in physicians was examined. A mediation model was further constructed to probe the mechanisms by which parents' IU affects children's trust in physicians.

Methods: The Intolerance of Uncertainty Scale-12 (IUS-12) and the Wake Forest Physician Trust Scale (WFPTS) were employed to conduct the questionnaire survey among 384 families (each family with a father, mother, and one child).

Results: IU and trust in physicians were found to be intergenerationally transmitted. The results of the APIM analyses showed that fathers' total IUS-12 scores negatively predicted their own ($\beta = -0.419$, $p < 0.01$) and mothers' ($\beta = -0.235$, $p < 0.01$) total WFPTS scores. Mothers' total IUS-12 scores negatively predicted their own ($\beta = -0.353$, $p < 0.01$) and fathers' ($\beta = -0.138$, $p = 0.017$) total WFPTS scores. The results of mediation analyses indicated that parents' total WFPTS scores and children's total IUS-12 scores mediated the effect of parents' total IUS-12 scores on children's total WFPTS scores.

Conclusion: The public's IU is a crucial influencing factor of their trust in physicians. Besides, the IU between couples and between parents and children could be mutually affected. On the one hand, husbands' IU could affect their own and their wives' trust in physicians, and vice versa. On the other hand, parents' IU and trust in physicians could affect their children's IU and trust in physicians, respectively.

Keywords: intolerance of uncertainty, trust in physicians, intergenerational transmission, the actor-partner interdependence model, mediation analysis

Introduction

Currently, a severe trust crisis has existed in the healthcare field, taking the form of mistrust between physicians and the public.[1,2] In the past decade, Chinese public trust in physicians has continued to decline, posing a great threat to the achievement of healthcare system reform. In a national survey, the proportion of the Chinese public reported to trust or strongly trust physicians reached 83.4% in 2011, while it decreased to 64.2% in 2016.[3] A latest national survey in China indicates that 57% of the Chinese public strongly trusted physicians.[4] Trust in physicians is associated with people's confidence in physicians' professionalism and motivation for treating patients, as well as people's expectations of and faith in physicians' actions for protecting patients' interests.[5] A paucity of trust in physicians can trigger reduced satisfaction with medical services,[6] frequent medical conflicts,[7] and even violence against healthcare workers.[8]

The factors affecting public trust in physicians can be roughly divided into three aspects: the characteristics of trustors (patients), the characteristics of trustees (physicians) and interpersonal interaction. The characteristics of trustors are

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mainly dependent on their general trust, medical history, and prior knowledge.[9] For instance, people with good public health literacy generally show higher trust in physicians' diagnosis, advice, and treatment.[10] The characteristics of trustees comprise physicians' professionalism,[11] as well as factors beyond technical competency such as physicians' empathy,[12] communication, fairness, honesty, and confidentiality.[13] Interpersonal interaction refers to physician-related information obtained by individuals through interpersonal communication. For instance, the public seeking health information or comments on physicians on the Internet can affect their trust in physicians.[14] Besides, as the main channel for social interaction, media coverage can also largely affect public trust in physicians.[15]

According to previous literature, trust in physicians can be categorized into interpersonal trust and general trust.[16] Interpersonal trust refers to patients' trust levels in their physicians in an established and specific physician-patient relationship. General trust comes to public trust in the whole group of physicians, not in a particular physician. Interpersonal trust is mainly derived from the direct experience acquired by patients during their diagnosis and treatment.[17,18] In addition to direct experience, general trust is also influenced by medical policies, family members, friends, or media reports.[19,20] Everyone is likely to be a patient because of illness. Public trust in physicians is salient in the formation of patients' trust in their physicians during treatment. It's noteworthy that public trust in physicians may differ from patients' trust in physicians. A study indicated that American public trust in physicians was declining year by year, while patients' trust in physicians remained relatively stable at a high level.[21] The same conclusion was also drawn in the research on Chinese public trust in physicians.[3]

The present study was with the purpose to probe the effect of IU on trust in physicians and analyzed the mutual effect between couples and the effect of parents on children. Specifically, drawing on the cognitive model of pathological worry, we first investigated the relationship between IU and trust in physicians. Besides, according to the family systems theory, we discussed the intergenerational transformation of IU and trust in physicians.[22] Moreover, drawing on the APIM, we probed the effect of parents' IU on their own and their spouses' trust in physicians.[23] With the above-mentioned explorations, we further constructed a mediation model to have insights into the effect of parents' IU on their children's trust in physicians, and the mediating roles of parents' trust in physicians and children's IU.

Relationship Between Intolerance of Uncertainty and Trust in Physicians

Individuals' trust in physicians is also affected by their own health condition and cognition, among which intolerance of uncertainty (IU) is considered as one of the factors predicting individuals' trust in physicians.[24] IU is defined as a dispositional trait caused by negative attitude toward uncertainty and its consequences, which refers to the propensity to negatively respond to uncertain events.[25] Uncertainty of medicine not only shows in the development of medical models, treatment, and concepts, but also in the complexity of illness, the limitations of cognition, and the change in the disease spectrum. In most cases, physicians can hardly give an unambiguous and specific explanation of the etiology, diagnosis, treatment, and prognosis of the illness.[26] This uncertainty may lower patients' and their relatives' trust in and satisfaction with physicians.[27]

The cognitive model of pathological worry assumes that IU is crucial in the occurrence and maintenance of worry.[28] Uncertain situations and events can usually bring nervousness, anxiety, and stress, subsequently leading individuals to pathologically worry about possible negative results.[29] Individuals with high IU have the propensity to pay extra attention to uncertain information, consider uncertain situations as hazardous, and anticipate the results being disastrous.[30] They also show inclination to view unpredictable events as unfair and questionable.[31] This may cause people's deficient confidence in physicians' professionalism, doubt about the reasonability of treatment, and even suspicion of the authenticity of diagnosis.[32] Accordingly, we extrapolated that IU could negatively predict trust in physicians.

Intergenerational Transmission of Intolerance of Uncertainty and Trust in Physicians

Family systems theory posits that one's character traits, behavior patterns, psychological quality, and judgment are largely affected by his parents.[22] Parents' personality traits usually have a great predictive effect on their children's, which may lead to children sharing similar IU and trust with their parents.[33] Generally, the characteristics of parents can greatly predict the characteristics of children.[33] In China where familism is ingrained, intergenerational transmission is

particularly salient.[34] Parents' trust in physicians can affect children's trust in physicians by means of intergenerational transmission. Family members' attitude and evaluation are crucial source of individuals' prior knowledge about physicians.[35] Parents' negative healthcare experiences, dissatisfaction with and grumbles about physicians can cause children's doubt on and mistrust in physicians.[36] Besides, in addition to patients' past misdiagnosis experiences, other family members' misdiagnosis experiences can decrease children's trust in physicians.[37] Hence, trust in physicians probably can be intergenerationally transmitted.

A spectrum of studies have demonstrated the intergenerational transmission of IU.[38] For instance, the attitude of different family members toward uncertainty of illness can be mutually affected.[39] High-IU parents' negative emotional experience and behavioral reaction in dealing with uncertain events may cause children's low tolerance of uncertain information.[40] Parenting refers to a kind of relatively stable behavioral style exhibited in the process of parents raising and educating their children.[41] According to previous literature, parents with high IU are prone to adopt negative parenting styles like treating their children harshly and highly harshly, which probably decreases children's tolerance of uncertain information.[42] If parents show limited love and warmth to their children, and rearing their children in a negative parenting style such as frequently criticizing and controlling their children, children's sense of controllability and self-efficacy would be impaired, and then their excessive worry and their repugnance and avoidance of uncertain events might be triggered. In addition, children tend to regard their parents as role models for learning[43,44] and gradually learn similar characteristics by observing and learning their parents' emotional reactions and behavior styles when dealing with uncertain events.[45] For instance, Gioia found that parents' IU can indirectly affect daughters' IU with daughters' psychological distress as the mediator.[46] In addition to parenting styles and observational learning, genetic factors may also be one of the reasons for the similarity in IU between parents and their children.[47] For example, insula is closely linked to uncertainty and anxiety.[48] In the uncertain context, the activation of a person's insula can enhance his detestation of uncertainty.[49] Therefore, we inferred that parents' IU could positively predict children's IU.

APIM Analysis of Intolerance of Uncertainty and Trust in Physicians

The family systems theory assumes that family is comprised of three subsystems: marital (or couple), parental, and sibling. Among them, marital relationships underlie parental and sibling relationships.[50] As a closely linked whole, couples are highly interdependent on each other in terms of cognition and behavior.[51] Besides, fathers and mothers cooperatively rather than independently raise their children.[52] In most cases, couples mutually influence each other, and jointly affect the psychology and behavior of their children.[53] Spousal and parent-child relationships are typical dyadic relationships in which one party's psychological quality and behavioral pattern can affect their own and another party's outcome variables. Therefore, the interdependence between family members should not be neglected in analyzing the associations between IU and trust in physicians from the familial perspective. As such, we employed actor-partner interdependent model (APIM) to investigate the reciprocal effect between spouses. The APIM is a theoretical framework designed for analyzing dyadic relationships (namely, committed and intimate two-person relationships) such as leader-follower and parent-child relationships, in which actor and partner effects are distinguished.[23] In the present study, the actor effect describes the effect of one party's IU on his or her own trust in physicians, while the partner effect represents the trust in physicians of one party affected by another party's IU. The family systems theory considers a family as one whole system in which the members are interrelated and interacted. In other words, family members show strong interdependence. As such, based on the family systems theory, we adopted the APIM to explore the effect of couple's IU on their own and their spouses' trust in physicians.

The APIM has been extensively used in the research on marriage and family fields.[54] Previous studies found that patients' negative coping approaches are positively connected with their own and their spouses' anxiety and depression.[55] The interaction between couples' uncertainty of illness and life quality has also been proved in the longitudinal research.[56] However, hitherto, no study has employed the APIM to investigate the impact of couples' IU on their trust in physicians. We hypothesized that husbands' IU not only could negatively predict their own trust in physicians (the actor effect) but also their wives' trust in physicians (the partner effect), and vice versa.

Gaps in Existing Literature and Establishment of Current Hypotheses

A further analysis of the factors and mechanisms affecting trust in physicians is of great significance to improve physician-patient relationship and promote the achievement of healthcare system reform. It's noteworthy that the public are potential patients, since everyone may become a patient for suffering from disease. Public trust in physicians can affect their behaviors in seeking medical advice, which is also a crucial influencing factor of physician-patient relationship.[9] Previous studies on the factors influencing trust in physicians mainly took patients as participants,[20] hence neglecting the different features shared by patients' and public trust in physicians.[57] At present, a few studies have probed the factors affecting general population's trust physicians.[50] Therefore, the present study set family as the fundamental unit and examined the effect of parents' IU on children's trust in physicians by constructing a mediation model on the basis of the analysis of the intergenerational transmission of IU and trust in physicians, as well as the effect of parents' IU on their own and spouses' trust in physicians. The findings could help better understand the influencing factors of public trust in physicians from the familial perspective.

To sum up, IU and trust in physicians are closely associated and intergenerationally transmitted, but scant studies have investigated these variables among the public. As such, the present study aimed to explore the relationship between IU and trust in physicians from spousal and parent-child perspectives among the public to provide theoretical references for the relevant studies. Specifically, according the analysis of the existing literature, we hypothesized: (1) IU could negatively predict trust in physicians; (2) IU could be intergenerationally transmitted; (3) trust in physicians could be intergenerationally transmitted; (4) couples' IU could predict their own and their spouses' trust in physicians. Based on the analysis of the relationship between IU and trust in physicians as well as the intergenerational transmission, we hypothesized: (5) parents' IU could influence their children's IU through intergenerational transmission, and then children's IU could influence their own trust in physicians; (6) parents' IU could influence their own trust in physicians, and then their trust in physicians could influence their children's trust in physicians through intergenerational transmission. After analyzing the APIM and the intergenerational transmission, we further hypothesized: (7) parents' IU could negatively predict their spouses' trust in physicians, and parents' trust in physicians could influence their children's trust in physicians through intergenerational transmission.

Materials and Methods
Study Design and Participants

College students were recruited for this study by the advertisement placed in two colleges. The inclusion criteria are as follows: (1) age≥18; (2) participants were voluntary for the survey; (3) parents were not divorced; (4) parents agreed to participate in the survey; (5) participants had no serious mental illness in recent three months; (6) participants did not experience serious traumatic events in recent three months. In the demographic information questionnaire, three statements were set to examine whether participants had serious mental illness or experienced serious traumatic events in recent three months. The three statements were: "In recent three months, I have been diagnosed with serious mental illness", "In recent three months, I have taken drugs to treat mental illness", and "In recent three months, I have experienced serious traumatic events". If participants responded "yes" to any of the above statements, they would be excluded. The survey was conducted through the Internet. Before the survey, participants carefully read and signed the informed consent in which the purpose and procedure of the survey and the anonymity and confidentiality of the data were detailed. The study protocol complied with the Declaration of Helsinki. Ethical approval for the present study was obtained from the Ethics Committee of Jilin International Studies University.

The questionnaire comprised the children-report version and the parents-report version. College students were required to complete the children-report version and send the link of the parents-report version to their parents. A code was given to each family for data matching. Four hundred and eighty-three college students were recruited in the present study. The criteria for removing invalid data are as follows: (1) the data could not be matched; (2) the data from one parent was missing; (3) the response time was too short (less than 2 SDs; SD represents standard deviation, and similarly hereinafter), or too long (more than *2* SDs);[58,59] (4) positive and negative items were reacted to identically. With

the criteria, we collected 462 valid children-report questionnaires, 401 valid father-report questionnaires and 436 valid mother-report questionnaires. Finally, we collected 367 questionnaires valid in both parents and children.

The description of participants is presented in Table 1. Specifically, 257 families resided in the city, and 110 resided in the countryside. 120 families had relatives as medical practitioners, and 247 had not relatives as medical practitioners. In the sample of children, participants were aged from 18 to 23 (Mean ± SD=19.25 ± 1.03) with 134 males and 233 females. In the sample of fathers, participants were aged from 40 to 58 (Mean ± SD=47.54 ± 4.01). In the sample of mothers, participants were aged from 38 to 58 (Mean ± SD=46.12 ± 4.09).

Instruments

Intolerance of Uncertainty Scale-12 (IUS-12)

The IUS-12 was developed by Carleton et al, comprising 12 items subsumed into 2 dimensions: prospective anxiety and inhibitory anxiety.[25] All items are responded on a Likert scale from 1 (not at all) to 5 (entirely). In other words, individuals who scored higher showed lower tolerance of uncertainty. The Chinese IUS-12 has great reliability and validity.[60] The Chinese IUS-12 is identical to its English counterpart in item number and content, but different in the naming of dimensions. In the Chinese IUS-12, the two dimensions are named anticipatory anxiety and debilitating anxiety, respectively. In the present study, the Cronbach' s α in the sample of fathers, mothers and children were 0.93, 0.92 and 0.93, respectively.

Wake Forest Physician Trust Scale (WFPTS)

The WFPTS is developed by Hall et al, including 10 items, and all items are rated on a Likert scale from 1 (strongly agree) to 5 (strongly disagree).[36] This scale is initially for evaluating patients' trust in physicians, with the statements such as "For sake of my health, my doctor will do whatever I need". In the present study, "I" in the items were substituted by "patients" so that the scale could be applied to assess public trust in physicians. For instance, the above item was changed into "For sake of patients' health, physicians will do whatever patients need". Katz found that the WFPTS showed satisfactory psychometric properties among general population older than 18.[61] In other words, individuals who scored higher indicated higher trust in physicians. In the present study, the Cronbach' s α in the sample of fathers, mothers and children were 0.87, 0.88 and 0.87, respectively.

Table 1 Description of Participants (n=367)

Variables	Characteristics	M±SD/n (%)
Children-Age (years, M±SD)		19.25 ± 1.03
Fathers-Age (years, M±SD)		47.54 ± 4.01
Mothers-Age (years, M±SD)		46.12 ± 4.09
Children-Gender	Male	134 (36.51%)
	Female	233 (63.49%)
Children-Grade	Freshman	159 (43.32%)
	Sophomore	138 (37.60%)
	Junior	70 (19.08%)
Children-Nationality	Han	330 (89.92%)
	Minority	37 (10.08%)
Fathers-Nationality	Han	343 (93.46%)
	Minority	24 (6.54%)
Mothers-Nationality	Han	340 (92.64%)
	Minority	27 (7.36%)
Residence	City	257 (70.03%)
	Countryside	110 (29.97%)
Families with or without relatives as medical practitioners	With	120 (32.70%)
	Without	247 (67.30%)

Abbreviations: M, mean; SD, standard deviation.

Data Analysis

SPSS 26.0 was utilized for data analysis. Since the present study mainly aimed to explore the relationship between the IU and trust in physicians of parents and children, we only focused on the total IU and WFPTS scores of parents and children instead of probing the relationship between diverse dimensions when analyzing the correlations, integrational transmission, APIM, and mediation effects. Considering the strong interdependence between family members, the data collected from all participants were not independent. Hence, we employed linear mixed effects models in which the family-level intercept is entered as a random effect to examine the predictive effect of parents on children. In the mixed linear regression analysis, we set the sex of children (0=male, 1=female), residence (0=urban, 1=rural), and whether there are medical workers in relatives (0=none, 1=yes) as covariates.

APIM_SEM, an online free application was employed to test the APIM.[62] The analyses used structural equation modeling (SEM) with maximum likelihood estimation using the R package lavaan.[63] The APIM of the impact of parents' IUS-12 scores on their own and their spouses' WFPTS scores was constructed. There are three general dyadic patterns, namely, the actor-only, the couple, and the contrast patterns. As the ratio of the partner effect to the actor effect, k values were utilized to assess dyadic patterns.[23] K values can be calculated with the prerequisite of the actor effect's standardized values statistically significant and higher than 0.10. The analysis of the APIM mainly refers to three steps. Firstly, parents' actor and partner effects should be computed. Their actor and partner effects are set as the same so that a comparison between the restricted model and the unrestricted model can be performed to test whether the actor and partner effects can be distinguished.[64] $\Delta\chi^2 > 0.20$ suggests that the effects of fathers and mothers are equal, so as to test them as distinguishable dyads in the following analysis. $\Delta\chi^2 > 0.20$ suggests to test them as indistinguishable dyads in the following analysis.[23] Secondly, the dyadic pattern of fathers and mothers should be figured out. Using 5000 bootstrap resamples, the confidence interval (CI) for k values is calculated. Specifically, the CI including 0 indicates the actor-only pattern; the CI including 1 suggests the couple pattern; the CI including −1 represents the contrast pattern; the CI between 0 and 1 shows the APIM between the actor-only and the couple patterns.[23] Thirdly, Whether the dyad members are sexually distinguishable should be examined. To this end, a completely indistinguishable model is constructed.[65] Afterward, using a chi-square test between one model with distinguishable dyads and its counterpart with indistinguishable dyads, model comparison is conducted to examine whether sex contributes to statistically significant differences. If $\Delta\chi^2 < 0.05$, it suggests that dyads are sexually distinguishable.

AMOS 24.0 was adopted to examine the mediation model. In the mediation model, parents' total IUS-12 scores were set as predictor variables; parents' total WFPTS scores and children's total IUS-12 scores were set as mediator variables; children's total WFPTS scores were set as outcome variables. χ^2/df<3, RMSEA<0.08, SRMR<0.05, CFI, TFI, IFI, and GFI>0.90 were set as the criteria for a well-fitted model.[66] To examine mediation, indirect effects were estimated using bootstrapping with 5000 iterations. If 0 is not in the 95% CI, it suggests that indirect effects are significant. $p < 0.05$ was set as the acceptable statistical significance.

Results
Analysis for Correlations Among Variables

The results of correlation analysis (see Table 2) indicate that the IU and trust in physicians of parents were significantly and positively correlated with those of children, and IU was significantly and negatively correlated with trust in physicians.

Table 2 Correlation Analysis for Parents' and Children's IUS-12 and WFPTS

	M	SD	I	2	3	4	5	6
1.F-IUS-12	25.72	10.12	-					
2.M-IUS-12	25.74	9.71	0.60**	-				
3.C-IUS-12	26.58	9.59	0.56**	0.61**	-			
4.F-WFPTS	37.55	7.69	−0.52**	−0.40**	−0.41**	-		
5.M-WFPTS	37.74	8.09	−0.44**	−0.49**	−0.42**	0.54**	-	
6.C-WFPTS	37.42	7.83	−0.39**	−0.44**	−0.47**	0.50**	0.54**	-

Note: **$p < 0.01$.
Abbreviations: M, Mean; SD, Standard Deviation; IUS-12, Intolerance of Uncertainty Scale-12; WFPTS, Wake Forest Physician Trust Scale; F, Fathers; M, Mothers; C, Children.

Analysis for Intergenerational Transmission

Linear mixed effects models were employed to analyze the intergenerational transmission of IU and trust in physicians. The results indicated that fathers' total IUS-12 scores (β=0.28, SE=0.05; F(367)=34.63, p<0.001; t=5.89, p<0.001) and mothers' total IUS-12 scores (β=0.43, SE=0.05; F(367)=75.39, p<0.001; t=8.68, p<0.001) could significantly and positively predict children's total IUS-12. Besides, fathers' total WFPTS scores (β=0.30, SE=0.05; F(367)=34.16, p<0.001; t=5.85, p<0.001) and mothers' total WFPTS scores (β=0.37, SE=0.05; F(367)=57.23, p<0.001; t=7.57, p<0.001) could also significantly and positively predict children's total WFPTS scores.

Analysis for the APIM

The APIM for the effect of the total IUS-12 scores on the total WFPTS scores was constructed. The results are presented in Table 3. Fathers' actor effect size was −0.327 (p<0.001, 95% CI [−0.43, −0.23]), and the standardized actor effect size was −0.411; mothers' actor effect size was −0.290 (p<0.001, 95% CI [−0.39, −0.19]), and the standardized actor effect size was −0.364. Restricted and unrestricted models showed no significant difference when examining the measurement invariance of fathers' and mothers' actor effects (p=0.600, 95% CI [−0.18, 0.10]).

Fathers' partner effect size was −0.111 (p=0.018, 95% CI [−0.21, −0.02]), and the standardized partner effect size was −0.140; mothers' partner effect size was −0.186 (p<0.001, 95% CI [−0.27, −0.10]), and the standardized partner effect size was −0.233. Restricted and unrestricted models showed no significant difference when examining the measurement invariance of fathers' and mothers' partner effects (p=0.251, 95% CI [−0.05, 0.20]).

Both fathers' and mothers' standardized actor effects were significant (effect size>0.1), which met the premise of computing k values. Fathers' k value was 0.340 and mothers' k value was 0.642. Adopting the bootstrap method to analyze the dyadic pattern, it was found that the 95% CI of fathers' k value was between 0.05 and 0.80; the 95% CI of mothers' k value was between 0.28 and 1.33. A further test revealed that the k values of fathers and mothers were not significant (p=0.391, 95% CI [−1.10, 0.32]).

The results of model comparison showed that $\chi^2(6)$ =3.983, p=0.679, suggesting that the effect of IU on trust in physicians was sexually distinguishable dyads.

Analysis for Mediation Effects

The results of mediation analysis are presented in Figure 1. Fathers' total IUS scores negatively predicted their own (β = −0.43, p < 0.01) and mothers' (β = −0.23, p < 0.01) total WFPTS' scores; mothers' total IUS-12 scores negatively predicted their own (β = −0.35, p < 0.01) and fathers' total (β = −0.14, p = 0.012) WFPTS scores; fathers' (β = 0.30, p < 0.01) and mothers' total (β = 0.43, p < 0.01) IUS-12 scores positively predicted children's total IUS-12 scores; fathers' (β = 0.24, p < 0.01) and mothers' (β = 0.32, p < 0.01) total WFPTS scores positively predicted children's total WFPTS scores; children's total IUS-12 scores negatively predicted their own total WFPTS scores (β = −0.24, p < 0.01). The model's fit indices were: χ^2/df=2.716, RMSEA=0.068, SRMR=0.028, CFI=0.992, TLI=0.970, IFI=0.992, GFI=0.990.

The results of bootstrapping for indirect effects are shown in Table 4. The 95% bootstrap CI of all paths did not include 0, suggesting that all paths were significant. Among them, the total indirect effect of fathers' total IUS scores on

Table 3 Parameter Estimates for Paths of the APIM

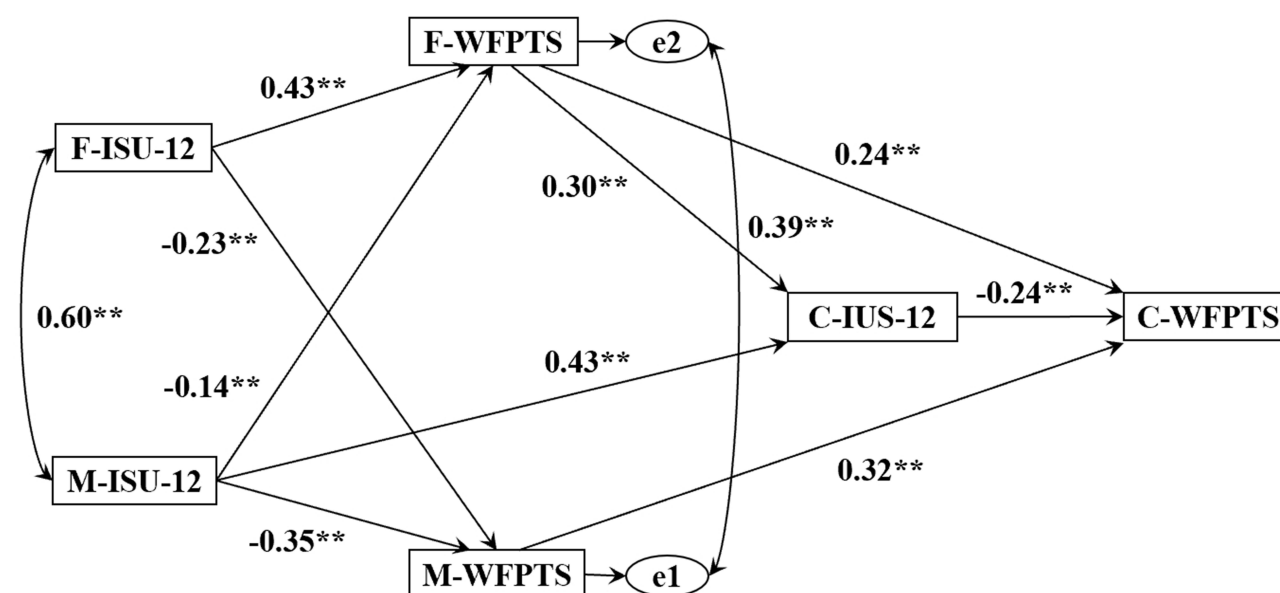| Effect	Estimate	Standardized Effect	95% CI	p
F-Intercept	37.545		[36.880, 38.202]	<0.001
F-Actor	−0.327	−0.411	[−0.426, −0.233]	<0.001
F-Partner	−0.111	−0.140	[−0.207, −0.020]	0.018
F-k	0.340		[0.053, 0.801]	
M-Intercept	37.745		[37.046, 38.450]	<0.001
M-Actor	−0.290	−0.364	[−0.393, −0.188]	<0.001
M-Partner	−0.186	−0.233	[−0.274, −0.100]	<0.001
M-k	0.642		[0.283, 1.327]	

Abbreviations: F, Fathers; M, Mothers.

Figure 1 The proposed mediation model.
Note: **p < 0.01; All coefficients were standardized.
Abbreviations: F, fathers; M, mothers; C, children; IUS-12, Intolerance of Uncertainty Scale-12; WFPTS, Wake Forest Physician Trust Scale.

children's total WFPTS scores was −0.249, and that of mothers' total IUS-12 scores on children's total WFPTS scores was −0.246.

Discussion

Trust has a pivotal role in measuring healthcare service quality and establishing a harmonious physician-patient relationship.[12] If the public tends to mistrust physicians' professionalism, treatment, and ethics, they are more likely to act defensive and dishonest, have malicious complaints,[67] or even violently harm physicians when seeking medical advice.[68] Explorations into the factors affecting trust in physicians help better meet people's needs for health and improve the increasingly tense physician-patient relationship. From the intergenerational perspective, we investigated the relationship between parents' IU and trust in physicians, and then further probed the mechanisms by which parents' IU affects children's trust in physicians. It was found that individuals' IU were significantly and negatively correlated with their trust in physicians. Besides, IU and trust in physicians could be intergenerational transmitted. Moreover, the analysis of the APIM indicated that parents' IU could significantly and negatively predict their own and their spouses' trust in physicians. The analysis of the mediation model revealed that parents' trust in physicians and children's IU played mediating roles in the predictive effect of parents' IU on children's trust in physicians. The findings have certain theoretical and practical significance for improving public trust in physicians.

Table 4 Indirect Effects of Parents' IU on Children's Trust in Physicians

	Effect	Boot SE	Boot CI Lower Limit	Boot CI Upper Limit
F-IUS-12 → F-WFPTS → C-WFPTS	−0.103	0.022	−0.128	−0.042
F-IUS-12 → C-IUS-12→ C-WFPTS	−0.072	0.015	−0.088	−0.029
F-IUS-12 → M-WFPTS → C-WFPTS	−0.074	0.016	−0.092	−0.029
M-IUS-12 → F-WFPTS → C-WFPTS	−0.033	0.014	−0.061	−0.006
M-IUS-12 → C-IUS-12 → C-WFPTS	−0.103	0.020	−0.126	−0.046
M-IUS-12 → M-WFPTS → C-WFPTS	−0.110	0.025	−0.141	−0.046

Abbreviations: F, Fathers; M, Mothers; C, Children; IUS-12, Intolerance of Uncertainty Scale-12; WFPTS, Wake Forest Physician Trust Scale.

The results of the present study indicated that individuals' IU was significantly and negatively correlated with their trust in physicians, supporting Hypothesis 1. Lu et al found that patients' IU was negatively predictive of trust in physicians.[69] Torbit et al found that the interaction between IU and trust in physicians could affect patients' worry about their illness.[70] With non-patients as participants, the present study drew the same conclusion, thus extending the applicability of this conclusion from patients to general population. Our findings imply that individuals' attitude toward and acceptance of medical IU need to be focused, when carrying out interventions in public trust in physicians. Besides, a gulf exists in the cognition of uncertainty of medicine between the public and physicians. Generally, the public's expectations of the progress and effect of treatment are much higher than physicians, with the belief that medicine can cure most illnesses.[71] Individuals with high IU may doubt physicians' professionalism when experiencing slow treatment progress, poor treatment effect, or misdiagnosis, thus reducing their trust in physicians.[37]

The total IUS-12 scores of fathers and mothers could positively predict the total IUS-12 scores of their children, suggesting that IU could be intergenerationally transmitted, in line with Hypothesis 2. It has been found in both general population and patients that parents' IU could positively predict children's IU.[46,72] However, these studies were conducted in the context of western culture. To our best knowledge, the present study is the first one that explored the intergenerational transmission of IU in the Chinese context and drew the similar conclusion. Mothers' effects on children were greater than fathers', probably because fathers and mothers play different roles in raising their children. In most cases, mothers would spend more time on taking care of children, so that mothers form a stronger bond with and exert a greater effect on their children.[73]

Mothers' predictive effects in the present research were found to be greater than those in previous research,[38] which may be justified by the distinction in familism between the west and China.[74] Authority-subordinate relationships are the prototypical characteristic of parent-child relationships in China.[75] Filial piety, the core of Confucianism, assumes that children should show absolute respect and obedience to their parents' notions, behavior, and will.[76] Parental over-protection and psychological control might hinder children from meeting their psychological needs, decreasing their perceived self-control, and increasing their IU levels.[77,78] A comparative study on China, America, and Turkey found that Chinese mothers usually adopt an authoritative parenting style, and more commonly control and meddle in their children's affairs,[79] which may also be one of the reasons why Chinese mothers have greater effects on children's IU than their western counterparts. Besides, the differences in family structures between China and the west are possibly another contributor. In China, grandparents would also foster their grandchildren, and even serve as the main caregivers.[80] Grandparents' participation in bringing up their grandchildren could negatively influence parents' parenting, thus leading to their grandchildren's worse psychological health, higher anxiety, and more worries.[81]

With a probe into the intergenerational transmission of trust in physicians, the present study found that parents' WFPTS scores could positively predict children's WFPTS scores, echoing Hypothesis 3. Trust can be divided into general trust and special trust. Concerning general trust, as a pervasive and relatively stable trait, its intergenerational transformation has been widely demonstrated.[82] However, scant studies have explored the intergenerational transmission of public trust in physicians. As a special form of interpersonal trust, public trust in physicians is a product of high expectations of physicians.[83] Patients' trust in physicians mainly derives from their direct experience of interaction with physicians in treatment,[84] whereas public trust in physicians mainly stems from indirect experience.[15] Previous studies overlooked the impact of family factors since they considered media reports on physician-patient events as the main source of individuals' indirect experience.[85] Apart from parents, the interaction and communication between other family members can also affect individuals' trust in physicians.

The present study has its novelty in that the interaction between parents' IU and trust in physicians was tested using the APIM for dyadic data. The present study found that fathers' dyadic pattern was between the actor-only pattern and the couple pattern, whilst mothers' dyadic pattern was the couple pattern, confirming Hypothesis 4. The couple pattern refers to individuals' outcome variables are affected by both their own and their spouses' predictor variables. The mixed pattern, as a special couple pattern, shows the greater actor effect than the partner effect.[23] In other words, fathers' and mothers' IU played the same vital role in affecting mothers' trust in physicians. By contrast, in terms of fathers' trust in physicians, fathers' IU exerted a greater impact than mothers' IU on it, although it was affected by both. Hence, asymmetry existed in the impact of parents' IU on each other's trust in physicians. A similar asymmetry has also been

found in previous research on marital satisfaction.[86] The possible reason is that males usually have a higher independent self-construal, while females usually have a higher interdependent self-construal.[87] Individuals high in independent self-construal prioritize themselves and seek separateness from others to maintain their uniqueness, while those high in interdependent self-construal prioritize others, seek connection with others, and volunteer to understand others' ideas and feelings.[88]

Based on the exploration into intergenerational transmission and the APIM, we constructed a mediation model to investigate the mechanisms by which parents' IU affects children's trust in physicians. The results showed that parents' trust in physicians and children's IU mediated the effect of parents' IU on children's trust in physicians. Specifically, on the one hand, through intergenerational transmission, parents' IU had an impact on children's IU, consequently affecting their trust in physicians. On the other hand, parents' IU negatively predicted their own and their spouses' physicians, subsequently influencing children's trust in physicians through the intergenerational transmission of trust in physicians, echoing Hypotheses 6 and 7, but only partly supporting Hypothesis 5. It suggests that interventions in both parents' IU and trust in physicians could affect children's IU and trust in physicians.

The present study is theoretically significant to some extent, since to our best knowledge, it pioneered to investigate the relationship between parents' and children's IU and trust in physicians among the public from the intergenerational perspective. Considering Chinese people's deep-seated familism, such perspective allows to have in-depth insights into the psychological mechanisms by which they form their trust in physicians.

Drawing on the family systems theory, the present study explored the intergenerational transmission of IU and trust in physicians, discussed the mutual interaction between parents, and analyzed the proposed mediation model. The findings supported the view that marital subsystem could affect the development of parental subsystem, which enriches and expands the family systems theory. Besides, based on the cognitive model of pathological worry, the present study probed the associations between IU and trust in physicians among three groups: fathers, mothers, and children. This model initially emphasizes the effect of IU on worry. Further including trust in physicians in this model, the present study found that the excessive worry of individuals with high IU probably influences their trust in physicians. Hence, the present study extends the applicability of this model to the field of physician-patient relationships.

The present study is also practically significant in a sense, since it could provide references for conducting interventional studies. The findings suggested that improving the public's acceptance of uncertainty and leading them to rationally treat the uncertainty in diagnosis and treatment can be conducive to reducing their high expectation of medicine and enhancing their trust in physicians.[29] According to previous research, the IU of the public gets lower when they obtain the information pertinent to diseases and physicians on the Internet.[89] Hence, publicizing health-related knowledge to the public and implementing medical education may help improve the public's tolerance of medical uncertainty. Moreover, both the influence of family factors and parents' attitude toward physicians should be considered when intervening in public trust in physicians. Our findings imply that when performing interventions in public trust in physicians, the family should be regarded as a fundamental unit. During treatment, physicians should establish a great relationship with patients and have good communication with their relatives.

The limitations of the present study are as follows. Firstly, the participants were students only from two colleges and their parents, so the sample might not be representative enough. Therefore, whether our findings are applicable to other groups needs to be further tested. Secondly, our cross-sectional study can hardly explain the causality between the variables, so a longitudinal study can be carried out in the future to further demonstrate the associations between IU and trust in physicians. Besides, the adoption of self-report measures might cause social desirability effect. Hence, questionnaire surveys, the implicit association test, and interviews need to be combined in our future work to make the findings more scientific. Thirdly, in the present study, children's IU and trust in physicians were set as outcome variables to explore the impact of parental characteristics on offspring characteristics. However, children's IU and trust in physicians may also exert an influence on parents. Accordingly, cross-lagged panel models need to be employed to investigate the reciprocal relationship between parents' and children's IU and trust in physicians.

Conclusion

In the present study, we found that individuals' IU was significantly and negatively correlated with their trust in physicians. The APIM indicated that parents' IU could negatively predict their own and their spouses' trust in physicians. Besides, the predictive effect of parents' IU on children's trust in physicians was mediated by parents' trust in physicians and children's IU. The present study helps better understand the mechanisms by which IU and trust in physicians are intergenerationally transmitted. These findings are theoretically and practically significant to the improvement of public trust in physicians.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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